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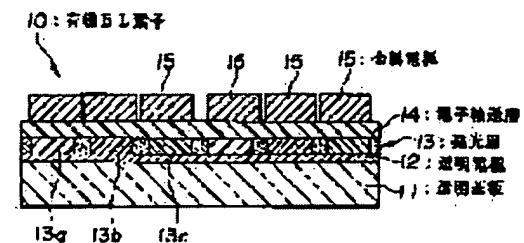
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(54) ELECTROLUMINESCENT AND ITS MANUFACTURE

(57) Abstract:

PURPOSE: To provide a manufacturing method for electroluminescent element which can select a film material to become a dispersing medium without depending upon the physical properties of the desired fluorescent pigment, perform film formation from the selected material, and can select the fluorescent pigment as desired without being restricted by the physical properties of an electric charge conveying film (layer) to become dispersing medium, and also provide an organic electroluminescent element of matrix display type to be yielded by this manufacturing method.

CONSTITUTION: A hole conveying layer 16, amphoteric conveyance layer to be provided as applicable, and electron conveying layer 14 are formed one over another on the transparent electrode side of a transparent base board 11 having a transparent electrode 12, and further a back electrode 15 to become an electron implantation type electrode is provided so that an intended electroluminescent element is fabricated. After formation of a layer to become an electron/hole recombination region among the conveying layers, fluorescent pigments R, G, B are applied and spread over the recombination region layer, heated, and dispersed in the recombination region layer so that a light emission layer 13 is formed.



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CLAIMS

[Claim(s)]

[Claim 1] To the transparent-electrode side of the transparent substrate which has a transparent electrode in one field, it is a hole transporting bed. The amphoteric transporting bed prepared if needed. The back plate which forms an electronic transporting bed one by one, and turns into an electron-injection type electrode on this electronic transporting bed further. It is the manufacture method of electroluminescence devices equipped with the above, and application expansion of the fluorochrome is carried out on this recombination field layer after formation of the layer which serves as a recombination field of an electron and a hole among each aforementioned transporting bed, and it is characterized by heating this fluorochrome subsequently and making it spread in the aforementioned recombination field layer.

[Claim 2] The manufacture method of the electroluminescence devices which separate these fluorochromes mutually, carry out application expansion on the aforementioned recombination field layer using two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome in the manufacture method of electroluminescence devices according to claim 1, and are characterized by heating the aforementioned recombination field layer subsequently and making the aforementioned fluorochrome diffuse in the aforementioned recombination field layer simultaneously.

[Claim 3] The manufacture method of the electroluminescence devices characterized by making these fluorochromes diffuse one by one in the aforementioned recombination field layer for every color while carrying out application expansion on the aforementioned recombination field layer using two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome in the manufacture method of electroluminescence devices according to claim 1 so that these fluorochromes may be mutually separated for every color.

[Claim 4] Electroluminescence devices characterized by making the layer which is equipped with the following, comes to prepare an amphoteric transporting bed between the aforementioned hole electronic transportation and an electronic transporting bed if needed further, and serves as a recombination field of an electron and a hole among each aforementioned transporting bed into the luminous layer a fluorochrome is made to come to spread. The matrix electrode which consists of a transparent electrode and a back plate. The hole transporting bed prepared in the transparent-electrode side. The electronic transporting bed prepared in the back plate side.

[Claim 5] Electroluminescence devices to which it is made to be spread by the field to which two or more sorts of fluorochromes which the aforementioned luminous layer presents the different luminescent color in electroluminescence devices according to claim 4 became independent, respectively, and is formed, and the field which these-became independent is arranged corresponding to each intersection position of the aforementioned matrix electrode, respectively, and is characterized by the bird clapper.

[Claim 6] Electroluminescence devices according to claim 4 or 5 characterized by using macromolecule gel as a layer used as the above-mentioned recombination field.

[Claim 7] Electroluminescence devices according to claim 4 or 5 characterized by using porosity silicon as a layer used as the above-mentioned recombination field.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the electroluminescence devices obtained by the manufacture method of the charge pouring type electroluminescence devices which used the organic thin film material, and this manufacture method.

[0002]

[Description of the Prior Art] In recent years, there is an electro RUMINNE sense element (EL element) as electroluminescence devices which the use to a luminescence display, the surface light source, etc. of display is expected, and are carried out in part. The thing of the structure shown in drawing 10 as a thing using the organic thin film material especially as such an EL element is known.

[0003] In drawing 10 , a sign 1 is an organic EL element, the transparent electrode 3 which consists of ITO (Indium Tin Oxide) etc. is formed on the transparent substrate 2, the thin film-like luminous layer 4 is formed on this transparent electrode 3, on this luminous layer 4, the electronic thin film-like transporting bed 5 is formed and, as for this organic EL element 1, the back plate 6 which functions as an electron-injection electrode on it is formed further.

[0004] Light is emitted in the color [coloring matter / emitter] the hole poured in from the electron which a luminous layer 4 functions as a hole transporting bed, and emitter coloring matter (fluorochrome) was made to distribute beforehand by the interior, emits light, and was poured in by electric-field impression from the back plate 6, and the transparent electrode 3 mainly recombines here, an exciton generates by this, and this exciton moves further, and corresponding to the kind.

[0005] In addition, the field which an electron and a hole recombine in this way is henceforth called a recombination field layer.

[0006] In order are in charge of manufacturing such organic EL element 1, especially to form a luminous layer 4, the dispersion-medium film (hole transportation film) which dissolved a dispersion-medium film component and dispersoid coloring matter into the common solvent, applied this solution on the transparent electrode 3 with wet methods, such as a DIP coat and a spin coat, dried after that, and distributed dispersoid coloring matter (fluorochrome) has been obtained. And if it is in organic EL element 1 obtained by doing in this way, luminescence wavelength can be arbitrarily set up by the ability distributing the fluorochrome of (1) arbitration.

[0007] (2) Since the common solvent is used, application also of a low material of film formation nature is attained as a film material for luminous layer formation.

[0008] (3) Defective generating resulting from crystallization of luminescent material at the time of adopting crystalline low things, such as polymer, as a distributed film can be prevented, and the problem of the life fall which this produces by defective generating can be solved.

[0009] It is supposed that there is an advantage of **.

[0010] Moreover, if it is in such an organic EL element, since blue luminescence is theoretically easy compared with an inorganic EL element, the application to a RGB individual light emitting device is expected from the time of development.

[0011]

[Problem(s) to be Solved by the Invention] However, since the luminous layer is formed with wet methods, such as a DIP coat and a spin coat, on the occasion of the manufacture, although selection of a common solvent becomes more important in luminous layer formation (membrane formation) in the organic EL element shown in drawing 10 In order to have to make into the thin film of hundreds - 1000A of numbers the charge transporting bed which usually consists of an electronic transporting bed, a hole transporting bed, and an amphoteric transporting bed further formed among

these if needed in an organic EL element. When the common solvent which fulfills the membrane formation conditions by the wet method in fact is used, the optimal membrane formation conditions cannot necessarily be set up to the material used as a dispersion-medium film, therefore there is un-arranging [that the manufacture is difficult].

[0012] Moreover, at the aforementioned organic EL element, in spite of having made the report as [many of] a RGB (red copper rust) individual light emitting device until now, even if it continues till present, there is no report of the organic EL element as multicolor and a full color matrix display device. It is thought that this is the causes with main it being difficult to carry out matrix formation of the organic thin film which constitutes the pixel of each RGB as a pixel pattern on the same substrate with technology, such as lithography and screen-stencil.

[0013] this invention is what was made in view of the aforementioned situation. the first purpose The film material which serves as a dispersion medium (dispersion layer), without being dependent on the physical properties of desired distributed coloring matter (fluorochrome) is chosen, and this can be formed further. And it is in offering the electroluminescence devices of the matrix display obtained by the manufacture method of the electroluminescence devices which can choose a fluorochrome arbitrarily, and this manufacture method, without receiving restrictions in the physical properties of the charge transportation film (charge transporting bed) used as a dispersion medium. Moreover, the second purpose of this invention is to offer the electroluminescence devices of the matrix display obtained by the manufacture method of of the multicolor or the full color electroluminescence devices which has two or more luminescent color, such as RGB, and this manufacture method.

[0014]

[Means for Solving the Problem] By the manufacture method of the electroluminescence devices according to claim 1 in this invention To the transparent-electrode side of the transparent substrate which has a transparent electrode in one field, a hole transporting bed, In the manufacture method of the electroluminescence devices which form the amphoteric transporting bed prepared if needed and an electronic transporting bed one by one, and prepare the back plate used as an electron-injection type electrode on this electronic transporting bed further Application expansion of the fluorochrome was carried out on this recombination field layer after formation of the layer which serves as a recombination field of an electron and a hole among each aforementioned transporting bed, and it made to heat this fluorochrome subsequently and to make it spread in the aforementioned recombination field layer into the solution means of the aforementioned technical problem.

[0015] Using two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome by the manufacture method of electroluminescence devices according to claim 2, these fluorochromes were separated mutually, application expansion was carried out on the aforementioned recombination field layer, and it carried out heating the aforementioned recombination field layer subsequently and making the aforementioned fluorochrome diffuse in the aforementioned recombination field layer simultaneously as the solution means of the aforementioned technical problem.

[0016] By the manufacture method of electroluminescence devices according to claim 3, while carrying out application expansion on the aforementioned recombination field layer using two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome so that these fluorochromes might be mutually separated for every color, it made to make these fluorochromes diffuse one by one in the aforementioned recombination field layer for every color into the solution means of the aforementioned technical problem.

[0017] The matrix electrode which consists of a transparent electrode and a back plate in electroluminescence devices according to claim 4, It has the hole transporting bed prepared in the transparent-electrode side, and the electronic transporting bed prepared in the back plate side. The layer which furthermore comes to prepare an amphoteric transporting bed between the aforementioned hole electronic transportation and an electronic transporting bed if needed, and serves as a recombination field of an electron and a hole among each aforementioned transporting bed made it the solution means of the aforementioned technical problem to have considered as the luminous layer a fluorochrome is made to come to spread.

[0018] In electroluminescence devices according to claim 5, it was made to be spread by the field to which two or more sorts of fluorochromes which the aforementioned luminous layer presents the different luminescent color became independent, respectively, and was formed, and the field which these-became independent has been arranged corresponding to each intersection position of the aforementioned matrix electrode, respectively, and made the bird clapper the solution means of the aforementioned technical problem. In electroluminescence devices according to claim 6, it made to have used macromolecule gel as a layer used as the above-mentioned recombination field into the solution means of the aforementioned technical problem. In electroluminescence devices according to claim 7, it made to have used porosity silicon as a layer used as the above-mentioned recombination field into the solution means of the aforementioned technical problem.

[0019]

[Function] The amphoteric transporting bed which is prepared a hole transporting bed and if needed according to the electroluminescence devices according to claim 1, Since application expansion of the fluorochrome is carried out on this recombination field layer after formation of the layer which serves as a recombination field of an electron and a hole among electronic transporting beds, this fluorochrome is subsequently heated and you make it spread in the aforementioned recombination field layer Since this layer is previously formed independently on the occasion of formation of a recombination field layer, the formation material can be chosen without being restrained by the physical properties of a fluorochrome. Moreover, also about a fluorochrome, since you make it spread in this layer after the recombination field stratification, arbitrary things can be chosen, without being restrained by the physical properties of the formation material of a recombination field layer.

[0020] Since two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome are used according to the manufacture method of electroluminescence devices a claim 2 and given in three, manufacture of the electroluminescence devices which emit light in two or more colors according to the luminescent color of a fluorochrome is attained.

[0021] In electroluminescence devices according to claim 4, since the layer used as the recombination field of an electron and a hole is made into the luminous layer a fluorochrome is made to come to spread, on the occasion of formation of this luminous layer, pattern processing of lithography, screen-stencil, etc. becomes unnecessary.

[0022] In electroluminescence devices according to claim 5, it is made to be spread by the field to which two or more sorts of fluorochromes which a luminous layer presents the different luminescent color became independent, respectively, and is formed, and since it comes to arrange the field which these-became independent corresponding to each intersection position of the aforementioned matrix electrode, respectively, the display in two or more colors is attained by the drive of a matrix electrode. In electroluminescence devices according to claim 6, the layer used as a recombination field, i.e., a luminous layer, is made into macromolecule gel, and diffusion of a fluorochrome becomes easy in macromolecule gel. Moreover, in macromolecule gel, it becomes diffusion of material other than a fluorochrome is also easy, and easy [introduction of the dopant aiming at improvement in charge transportability, reduction of a hole or an electron-injection obstruction, etc.]. In electroluminescence devices according to claim 7, the layer used as a recombination field, i.e., a luminous layer, is used as porosity silicon, and it is possible in a porosity silicon film making thickness and electronic physical properties uniform on the occasion of the formation, and equalization of the brightness in electroluminescence devices can be attained.

[0023]

[Example] Hereafter, this invention is explained in detail.

[0024] Drawing 1 and drawing 2 are drawings showing one example at the time of applying the electroluminescence devices according to claim 5 in this invention to the organic EL element for a color matrix display, and a sign 10 is an organic EL element in these drawings.

[0025] This organic EL element 10 forms transparent-electrode 12 -- which consists of ITO etc. in the shape of a stripe on the transparent substrate 11, and is these transparent electrodes 12. -- Luminous layer 13 -- is formed in the shape of a dot upwards, the electronic transporting bed 14 is formed on this luminous layer 13, and further, on it, stripe-like metal-electrode 15 -- is formed, as it intersects perpendicularly with aforementioned transparent-electrode 12 --. In addition, transparent-electrode 12 -- and metal-electrode 15 -- cross at right angles mutually, and the matrix electrode is constituted by carrying out formation arrangement.

[0026] Here, luminous layer 13 -- distributes a fluorochrome (distributed coloring matter) by diffusion in this dispersion-medium film so that for example, the poly N vinylcarbazole (PVCz) etc. may be used as the dispersion-medium film (dispersion-medium layer) which functions as a hole transporting bed and may be mentioned later. Moreover, in this example, as shown in drawing 1 and drawing 3 , it is cheated out of a different color in a luminous layer 13, and the fluorochrome which specifically presents red, green, and three sorts of blue luminescent color, respectively distribution (diffusion), and red luminescence section 13a, green luminescence section 13b, and blue luminescence section 13c dissociate mutually by this, namely, it is formed independently into the luminous layer 13, respectively. In addition, as a fluorochrome, things, such as a coumarin system (green - yellow), a perylene system (red), an oxazole system (green - yellow), an oxazine system, a naphthalene system (blue), and a quinolone system, are chosen suitably, and are used.

[0027] Moreover, the electronic transporting bed 14 consists for example, of an aluminum oxy-complex etc. In addition, as above-mentioned luminous layer (hole transporting bed) 13 --, the electronic transporting bed 14, or an amphoteric transporting bed, conductive polymer compounds other than **** can also be used. For example, macromolecule gel can be used as above-mentioned luminous layer 13 --, i.e., the above-mentioned recombination

field layer. That is, macromolecule gel can be used as the dispersion-medium film (dispersion-medium layer) which functions as a hole transporting bed, and distribution of coloring matter becomes easy in this case as compared with the former (PVCz etc.). Furthermore, since it becomes easy [the material diffusion of those other than coloring matter] in this case, it becomes easy [introduction of the dopant aiming at improvement in hole transportability, reduction of the hole pouring obstruction from an anode, etc.]. Therefore, it becomes improvable [a positive thin film property]. Moreover, as above-mentioned luminous layer 13 --, i.e., the above-mentioned recombination field layer, porosity silicon can be used, for example. That is, let porosity silicon be the dispersion-medium layer which functions as a hole transporting bed. This porosity silicon layer porosity-izes the polysilicon contest film deposited by the CVD (chemical vapor deposition) method etc. for example, on the ITO electrode according to anodic oxidation. Since this porosity silicon layer can acquire thickness and electronic physical properties as a uniform film by the dry process, it can realize equalization of brightness.

[0028] Moreover, metal-electrode 15 -- becomes a back plate, and is formed from the high metal of the low of work functions, such as In, Mg, and calcium, i.e., electron-injection nature. By forming metal-electrode 15 -- from such a metal, they are pouring of the carrier (a hole, electron) from each electrode (transparent-electrode 12 --, metal-electrode 15--), and a luminous layer 13. -- Reunion inside is performed efficiently and the electroluminescence devices 10 obtained as a result become the high thing of luminescent ability.

[0029] In addition, each luminescence sections 13a, 13b, and 13c in aforementioned luminous layer 13 -- were arranged corresponding to each intersection position of the matrix electrode which becomes aforementioned transparent-electrode 12 -- from metal-electrode 15 --, respectively.

[0030] The electron poured in from a metal electrode 15 if it is in such organic EL element 10 passes along the electronic transporting bed 14, and it is a luminous layer 13. -- Luminous layer 13 on which the hole which results inside and is poured in from a transparent electrode 12 on the other hand functions also as a hole transporting bed -- It results inside, and when an electron and a hole recombine within this luminous layer 13, light is emitted in the color according to the kind of fluorochrome.

[0031] Here, the electronic physical properties of a thin film material which may serve as the mechanism for the hole transporting bed turning into a luminous layer in this organic EL element 10, i.e., an electronic transporting bed, (ETL), and a hole transporting bed (HTL) [a luminous layer] are explained using drawing 4. Drawing 4 is the energy diagram of the carrier expressed in the form of the workload when setting the absolute value of ionization potential and an electron affinity to I_p and E_a , respectively, and pulling apart the concept of a work function (Wf), i.e., an electron, from restraint of the Coulomb force in each thin film layer in infinite distance. In addition, electronic potential becomes small inside an individual with more big Wf, and the potential of a hole becomes small inside an individual with more small Wf to this.

[0032] About an electron injection, although an energy barrier with the size between Cathode (metal electrode 15) Wf and ETL E_a exists, since this obstruction is fully small to external electric field, an electron injection is performed easily. And the electron poured in into ETL moves to an interface with HTL by external electric field. Moreover, since electronic potential tends to become small more, the electron transfer from ETL to HTL advances spontaneously rather.

[0033] On the other hand, although an energy barrier with the size between Anode (transparent electrode 12) Wf and HTL I_p exists, since this obstruction is also fully small to external electric field about hole pouring, hole pouring is performed easily. And it moves to an interface with ETL by external electric field in the hole poured in into HTL. Moreover, to external electric field, since the energy barrier between ETL I_p and HTL I_p is very large, as for pouring of the hole from HTL to ETL, it becomes difficulty.

[0034] For this reason, the hole poured in from the anode is confined in HTL, and an electron flows into HTL from ETL to this, therefore the reunion of a hole and an electron is produced in the ETL and HTL side of a HTL interface. although the energy of the exciton produced by reunion will change to the HTL itself at this time if HTL is the single matter -- more -- fluorescence wavelength -- long -- and -- or when the big coloring matter of a fluorescence yield lives together to this recombination part, energy changes are alternatively performed to the fluorochrome molecule, and a thin film makes luminescence resulting from the fluorescence of a fluorochrome molecule

[0035] In addition, although drawing 4 showed the example as which this layer functions as a luminous layer when a hole transporting bed (HTL) turns into a recombination field layer, therefore a fluorochrome is made to live together in this layer An electronic transporting bed is used as a recombination field layer depending on selection of the thin film material which forms an electronic transporting bed (ETL) and a hole transporting bed (HTL). Therefore, it is also possible to make this layer into a luminous layer, and it is also possible to prepare an amphoteric transporting bed between an electronic transporting bed (ETL) and a hole transporting bed (HTL) further, to use this layer as a

recombination field layer, and to make this amphoteric transporting bed into a luminous layer by this.

[0036] Next, the manufacture method of such an organic EL light emitting device 10 is explained.

[0037] First, the transparent substrate 11 which formed transparent-electrode films, such as ITO, beforehand by the vacuum deposition, the spatter, etc. is prepared, and as a transparent-electrode film is patternized in the shape of a stripe by etching etc. and shown in drawing 5 (a) and (b), transparent-electrode 12 -- is formed on the transparent substrate 11.

[0038] Next, about the material which forms hole transporting beds, such as the poly N vinylcarbazole (PVCl), as shown in drawing 6 (a) and (b), it is the aforementioned transparent electrode 12 by wet methods, such as a spin coat and a dipping coat, or the vacuum deposition. -- Membranes are formed upwards and the hole transporting bed 16 is formed. It is the metal electrode 15 shown in drawing 2 about membrane formation of the material which forms this hole transporting bed 16 here. -- It is [inner] a transparent electrode 12 each all the time three. -- One intersection each is made into one unit (pixel), and by forming membranes for every units of these, it carries out so that the whole may become dot-like. In addition, about drawing 5 (a), (b), drawing 6 (a), (b) and drawing 7 (a) that carries out a postscript, (b) - drawing 10 (a), and (b), the plan and sectional side elevation only about the aforementioned unit (pixel) are shown.

[0039] Next, the fluorochrome B which presents the fluorochrome G which presents the fluorochrome R which presents red luminescence on the hole transporting bed 16 formed by doing in this way as shown in drawing 7 (a) and (b), and green luminescence, and blue luminescence is mutually separated by screen printing or the ink-jet method, respectively, and application expansion is made and carried out.

[0040] Subsequently, by irradiating infrared radiation at the side which developed the aforementioned fluorochromes R, G, and B using the infrared lamp 17, and heating these fluorochromes R, G, and B and the hole transporting bed 16, as shown in drawing 8 (a) and (b) A luminous layer 13 is formed at the same time it forms red luminescence section 13a, green luminescence section 13b, and blue luminescence section 13c by making these fluorochromes R, G, and B diffuse in the hole transporting bed 16.

[0041] In addition, about heating diffusion of a fluorochrome, it is not from the side which developed this fluorochrome, and it may heat from the transparent substrate 11 side, and heaters, such as not infrared heating but a hot plate, may be used in that case, and you may heat by heat conduction. Thus, if it heats from the transparent substrate 11 side, the coloring matter loss to which the fluorochrome which used the expansion side of a fluorochrome since temperature became low from the transparent substrate 11 originated in sublimation when sublimability was high can be reduced.

[0042] Moreover, it may develop with-like [solid-state], and it may be made to dissolve in a proper solvent and you may make it develop by the shape of a solution about expansion of Fluorochromes R, G, and B.

[0043] Subsequently, the material which forms electronic transporting beds, such as an aluminum oxy-complex, is formed on a luminous layer 13 by the vacuum deposition etc., as shown in drawing 9 (a) and (b), and the electronic transporting bed 13 is formed.

[0044] Then, it intersects perpendicularly with transparent-electrode 12 --, and each red luminescence section 13a-- of a luminous layer 13, green luminescence section 13b--, and organic EL element 10 of blue luminescence section 13c-- that was made to correspond to each, formed metal-electrode 15 -- in right above [of these] by the spatter etc., and was shown in drawing 1 and drawing 2 are obtained.

[0045] Since Fluorochromes R, G, and B are developed, and this is heated further, it is spread in the hole transporting bed 16 and a luminous layer 13 is formed on it after forming previously the hole transporting bed 16 used as a recombination field layer, if it is in such a manufacture method The material which forms the hole transporting bed 16 can be chosen without being restrained by the physical properties of Fluorochromes R, G, and B. also about Fluorochromes R, G, and B Since you make it spread in this layer after hole transporting-bed (recombination field layer) 16 formation, arbitrary things can be chosen without receiving restrictions in the physical properties of the formation material of the hole transporting bed 16.

[0046] Moreover, the manufacturing cost was also reduction-ized, while the manufacture became easy, therefore the yield increased, since pattern processing of lithography, screen-stencil, etc. was not used for formation of a luminous layer 13, if it was in the organic EL element obtained by doing in this way.

[0047] Moreover, it has red luminescence section 13a which the luminous layer 13 was made to be spread by the field which became independent, respectively, and was formed, green luminescence section 13b, and blue luminescence section 13c, and each [these] luminescence section is [-- Metal electrode 15 / -- (matrix electrode) A full color display is attained by drive.] a transparent electrode 12, respectively. -- Metal electrode 15 -- Since it is arranged corresponding to the intersection position, they are these transparent electrodes 12.

[0048] In addition, although the aforementioned example explained by the case where heated these fluorochromes R, G, and B simultaneously, and they are made to diffuse after carrying out application expansion of the fluorochromes R, G, and B, respectively, this invention is not restricted to this method. For example, after dried this, having carried out application expansion of the fluorochrome G subsequently, drying this, carrying out [having carried out application expansion of the fluorochrome R,] application expansion of the fluorochrome B after that and drying this, you may diffuse each fluorochrome of RGB in a recombination field layer simultaneously by heating mentioned above.

Moreover, you may make the process of application expansion and heating diffusion repeat for every fluorochrome, as application expansion of the fluorochrome R is carried out, carry out heating diffusion of this, subsequently carry out application expansion in Fluorochrome G, heating diffusion is carried out in this, application expansion is carried out in Fluorochrome B after that and this was said as carrying out heating diffusion.

[0049] Moreover, although each luminescence section was formed in the luminous layer 13 using three sorts of things which emit light in red, green, and blue as a fluorochrome, only any one sort or two sorts of fluorochromes may be used, and the fluorochrome which emits light in colors other than the further aforementioned color may be used. Moreover, although the luminous layer 13 was formed in the shape of a dot in the aforementioned example, each luminescence sections 13a, 13b, and 13c may be formed in the shape of a stripe, or the luminous layer 13 whole may be formed in the shape of [two or more] a stripe.

[0050] Furthermore, although it diffused the fluorochrome in this hole transporting bed as the hole transporting bed 16 became a recombination field, and it considered as the luminous layer 13 in the aforementioned example An electronic transporting bed is used as a recombination field layer depending on selection of the thin film material which forms an electronic transporting bed and a hole transporting bed as mentioned above. Therefore, this layer can also be made into a luminous layer, an amphoteric transporting bed can be further prepared between an electronic transporting bed and a hole transporting bed, and this layer can be used as a recombination field layer, and, thereby, also let this amphoteric transporting bed be a luminous layer.

[0051]

[Effect of the Invention] As explained above, the manufacture method of the electroluminescence devices according to claim 1 in this invention Application expansion of the fluorochrome is carried out on this recombination field layer after formation of a recombination field layer and the becoming layer. Subsequently, since this fluorochrome is heated and you make it spread in the aforementioned recombination field layer, it can choose on the occasion of formation of a recombination field layer, without the physical properties of a fluorochrome restraining the formation material by forming this layer independently previously. Moreover, also about a fluorochrome, since you make it spread in this layer after recombination field layer formation, arbitrary things can be chosen, without being restrained by the physical properties of the formation material of a recombination field layer. Therefore, when the flexibility on material selection increases, the manufacture condition is eased and, thereby, productivity can be raised.

[0052] Since the manufacture method of electroluminescence devices a claim 2 and given in three uses two or more sorts of fluorochromes which present the different luminescent color as the aforementioned fluorochrome, it can manufacture the electroluminescence devices which emit light in two or more colors according to the luminescent color of a fluorochrome.

[0053] The manufacturing cost was also reduction-ized, while the manufacture became easy, therefore the yield increased, since electroluminescence devices according to claim 4 were made into the luminous layer a fluorochrome is made to come to spread the layer used as the recombination field of an electron and a hole, and pattern processing of lithography, screen-stencil, etc. became unnecessary on the occasion of formation of this luminous layer.

[0054] It is made to diffuse electroluminescence devices according to claim 5 by the field to which two or more sorts of fluorochromes which a luminous layer presents the different luminescent color became independent, respectively, and they are formed, and since the field which these-became independent is arranged corresponding to each intersection position of the aforementioned matrix electrode, respectively, they can perform the display in two or more colors by the drive of a matrix electrode.

[0055] Electroluminescence devices according to claim 6 can make distribution of a fluorochrome easy by having made the recombination field layer used as a luminous layer into macromolecule gel. Furthermore, macromolecule gel becomes easy [introduction of the dopant aiming at improvement in hole transportability, reduction of the hole pouring obstruction from an anode, etc.], since it becomes easy [the material diffusion of those other than coloring matter]. Therefore, it becomes improvable [the positive thin film property by introduction of a dopant].

[0056] The recombination field layer from which electroluminescence devices according to claim 7 serve as a luminous layer is able for a porosity silicon film to porosity-ize the polysilicon contest film deposited by CVD etc. for example, on the ITO electrode according to anodic oxidation by considering as porosity silicon, and to obtain as a film

with homogeneous thickness and electronic physical properties by the dry process. Therefore, equalization of brightness is realizable by using porosity silicon as a luminous layer.

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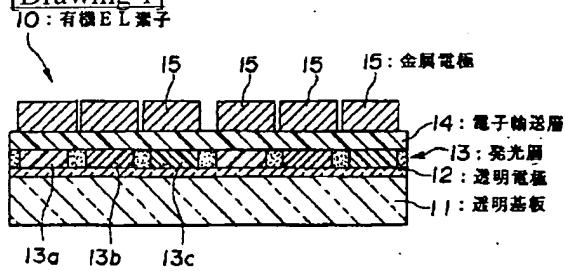
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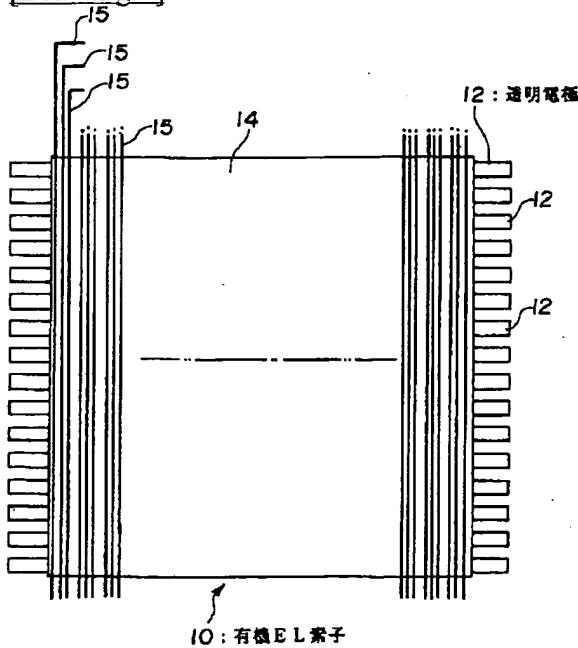
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3. In the drawings, any words are not translated.

DRAWINGS

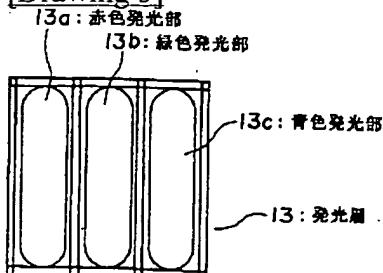
[Drawing 1]



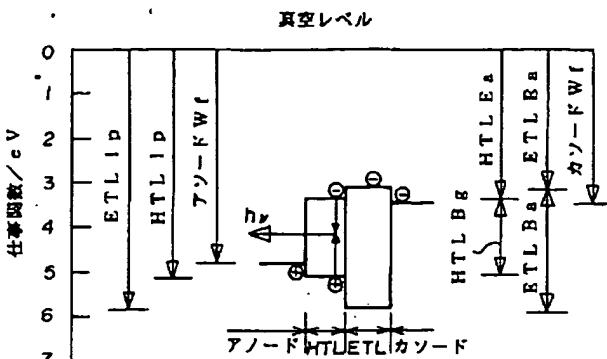
[Drawing 2]



[Drawing 3]



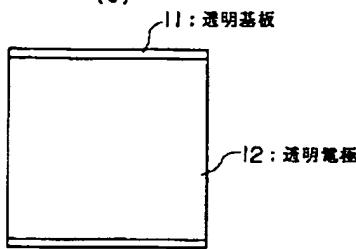
[Drawing 4]



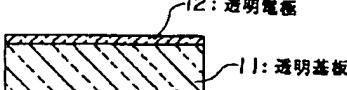
WF : 仕事関数、1D : イオン化ボテンシャル、
Ea : 電子超和力、Bg : バンドギャップ、t : 膜厚
HTL : ホール輸送層、ETL : 電子輸送層

[Drawing 5]

(a)

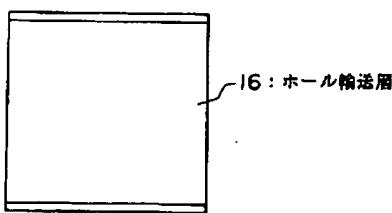


(b)



[Drawing 6]

(a)

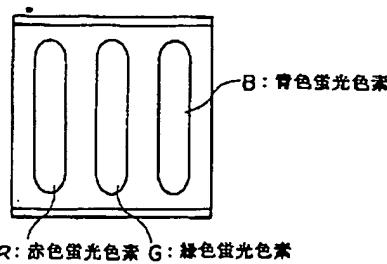


(b)

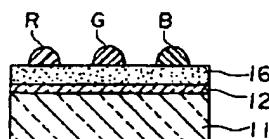


[Drawing 7]

(a)

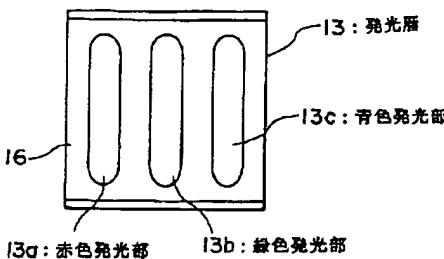


(b)

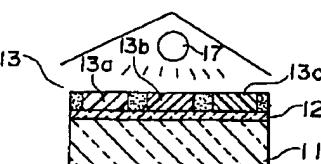


[Drawing 8]

(a)

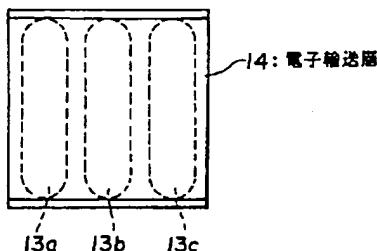


(b)

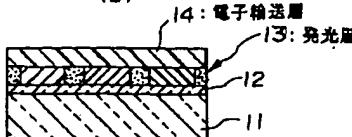


[Drawing 9]

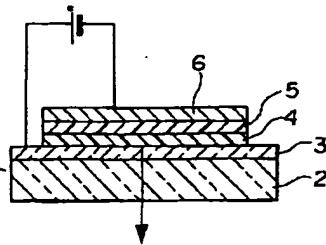
(a)



(b)



[Drawing 10]



[Translation done.]